

COUPP-2L Water Management Plan

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This document describes in broad strokes our plan for getting the high purity water into the Inner Vessel assembly for COUPP-2L. We still plan to do the water fill at Fermilab and ship the sealed inner vessel with water. We are planning to backfill with argon for shipping. The facts on the ground are that we have some SNO water in the original shipping container, but we do not know how much we have. We could in principle weigh the tank, but I don't think we have a record of the tare weight of the container. The container also has some fittings "for which we also have no data." We also have a source of new high purity water from the 60-kg fluid-handling cart. Therefore here is the plan (at least in broad outline:)

- 1) Note Install and CALIBRATE pressure transducers BEFORE initiating any water transfer work. We need to know an accurate inner vessel pressure in order to understand what is going on in the distillation and in subsequent operations.
 - a. There was an issue in the previous fill.
 - i. The inner vessel pressure transducer claimed that we had a small 3 PSIA pressure in the inner vessel. It should only have had water vapor pressure, and that is only a few tenths of a PSIA.
 - ii. During the glycol fill and de-gassing operations, the inner vessel wanted to extend the bellows. This is consistent with some non-zero inner vessel pressure.
- 2) Mobilize the distillation apparatus.
 - a. Collect, bag, and tag all of the parts.
 - b. Review and re-approve the cleaning procedures.
 - c. Send the still parts to A0 for cleaning.
 - d. Set up the distillation apparatus at Lab 3.
- 3) Transfer the SNO water (whatever quantity we have)
 - a. This requires a written procedure.
 - b. Nominally we use old N₂ to push the water into the evacuated still.
- 4) If there is enough SNO water, then we're in business
 - a. (How much is enough?) First establish the volumes. Get the vessel volume as a function of liquid level from the original drawings. (Compare to old John Rausch estimate of the total volume, made from the 3-D model.)
 - b. Measure the bellows volume (it's easy while it is out waiting for cleaning.)

- c. Establish the still volume as a function of column height. We can put some graduation marks on the still and get a good volume record from that if we sight across front and back graduation marks.
 - d. The inner vessel assembly will be in a clear bell jar for cooling. We can also provide some graduation marks for that as well.
 - e. We should start out with an understanding of the target column height in the still, and of the target column height in the inner vessel (and the height expected to be left in the still when we've completed the distillation.) Visual volume estimators will be sufficient for monitoring the distillation.
 - f. We transfer the SNO water until the still is fully loaded or until the SNO transfer vessel is empty.
- 5) If we run short of SNO water, then we will have the empty SNO transfer vessel to use with the 60-kg fluid-handling cart. The next step would be to use the fluid-handling cart to refill the SNO transfer vessel. This will also require a written procedure.
- 6) Once we have a full water load in the still, then we can proceed with the distillation.
- 7) The idea would be to distill as we have always done, and to leave the vessel under vacuum until we're ready to put the assembly into its shipping containment. We would backfill the inner vessel with argon at that point.

Written Procedures Required:

- 1) A0 Cleaning Procedure for the Still Components
- 2) Water transfer to still from SNO transfer vessel Procedure
- 3) Inner Vessel Pressure Transducer Calibration Procedure
- 4) Procedure for Re-Filling the SNO Transfer Container from the Fluid Handling Cart.
- 5) Water Distillation / Water Fill Procedure.